UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/647,140	08/25/2003	Kater Davis Hake	1760-297	1047

6449 7590 06/01/2007

ROTHWELL, FIGG, ERNST & MANBECK, P.C.
1425 K STREET, N.W.
SUITE 800
WASHINGTON, DC 20005

EXAMINER	
BAGGOT, BRENDAN O	
ART UNIT	**PAPER NUMBER**
1638	

NOTIFICATION DATE	DELIVERY MODE
06/01/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PTO-PAT-Email@rfem.com

Office Action Summary	Application No.	Applicant(s)	
	10/647,140	HAKE ET AL.	
	Examiner	Art Unit	
	Brendan O. Baggot	1638	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 February 2007 and 16 February 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14,16-19,22,23,25-37,39-42 and 88-124* is/are pending in the application.

4a) Of the above claim(s) *11* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10,12-14,16-19,22,23,25-37,39-42 and 88-124* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Non-Final Rejection

1. The text of those sections of title 35 U.S.C. not included in this action can be found in a prior Office action.

2. Any rejections from a prior Office Action not repeated herein are withdrawn.

3. The Office acknowledges the receipt of Applicant's papers filed 2/12/07 and 2/16/07. The papers filed 2/16/07 are not identical to the papers filed 2/12/07.

4. Claims 15, 20-21, 24, 38, 43-87 have been cancelled. Claims 1-14, 16-19, 22-23, 25-37, 39-42, and newly added claims 88-124 drawn to RNAi, CA and DGAT, and seed oil biosynthesis suppression are pending. Claim 11 is withdrawn. Claims 1-10, 12-14, 16-19, 22-23, 25-37, 39-42 and 88-124 are examined in the instant application.

5. Rejection of Claims 2, 17, 18, 23, 25 and 32-35 under 35 U.S.C. §112, second paragraph, is withdrawn in view of Applicant's amendments and arguments.

Claim Objections

6. Claim 11 is drawn to non-elected subject matter: i.e. non-elected suppressing seed oil storage. Applicant elected suppressing seed oil biosynthesis. (*See* Applicant's Restriction election, page 2). Any claims drawn to suppressing seed oil biosynthesis are similarly objected to. Appropriate correction is required.

7. Claims 16-17, 18, 22, 25, 100, and 102 are drawn to non-elected subject matter. Applicant elected CA and DGAT ONLY. (*See* Applicant's Restriction election,

page 2). Any claims drawn to sequences other than CA and DGAT are similarly objected to. Appropriate correction is required.

8. Claims 16, 19-26, 93-99, 100 and 103 are drawn to non-elected subject matter. Applicant elected RNAi ONLY. (*See* Applicant's Restriction election, page 2). Appropriate correction is required.

9. Regarding Claim 93, since the claim reads on sense expression, the claim reads on non-elected subject matter. Adding language to limit the expression to RNAi would obviate this objection.

10. Regarding Claims 1 and 88-90 and their dependents, since the claims read on compositions other than those doubly transformed with CA and DGAT, the claims reads on non-elected subject matter. (*See* Applicant's Restriction election, page 2). Adding language to limit the expression to doubly transformed with CA and DGAT would obviate this objection.

11. Regarding claims 18, 25 and their dependents, the recitation of "(AC)" as an abbreviation for carbonic anhydrase appears to be a typographical error. Appropriate correction is required.

12. Regarding claims 22, 100, and 102 and their dependents, the recitation of "any combination thereof" reads on combinations other than doubly transformed with CA and DGAT which are non-elected. Appropriate correction is required.
Appropriate correction is required. (*See* Applicant's Restriction election, page 2).

Claim Rejections - 35 U.S.C. §112, 1st paragraph

13. Claims 1-10, 12-14, 16-19, 22-23, 25-37, 39-42 and 88-124 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. This rejections is maintained for reasons of record set forth in the Official action mailed 8/10/06. Applicants arguments filed 2/12/07 and 2/16/07 have been fully considered but are deemed not persuasive.

Applicant broadly claims a reduced seed oil plant or plant cell comprising a gene of unspecified source, identity, length, or design that suppresses seed oil biosynthesis in a plant that is either a transgene or a mutant allele.

Applicant only describes by incorporation through reference polynucleotide sequences of unspecified source or number encoding carbonic anhydrase, and 3 prior art polynucleotide sequences that encode a DGAT polypeptide one each from tobacco, *Arabidopsis*, and *Brassica*.

Applicant does not describe a representative number of mutant alleles that suppress seed oil biosynthesis or the conserved regions of the broadly claimed genus of mutant alleles that suppress seed oil biosynthesis or any transgenes, either first or second or early or late in the seed oil biosynthesis pathway, or the conserved portions or regions common to that broadly claimed genus that would suppress seed oil biosynthesis when transformed into a plant

Furthermore, applicant does not describe any RNAi construct that would suppress seed oil biosynthesis in a plant.

Applicant describes RNAi strategies known to those skilled in the art. (para. 49). While RNAi strategies are known, the specific 20-30 nucleotide RNAi sequence specific for DGAT or CA to be used to down regulate seed-oil biosynthesis is not known nor is it described by applicant.

Applicant does not describe any RNAi sequence which is specific for DGAT or CA, which have the art recognized physical structure of RNAi molecules. Furthermore, Applicant does not describe which portions of the DGAT and CA genes would not form the proper structure for effective seed-oil biosynthesis suppression. Applicants are encouraged to point to the line and page number which goes beyond the mere recitation of a gene sequence which is to be targeted and which also provides the actual description of an operative, fully described RNAi molecule that when transformed into a plant results in the suppression seed oil biosynthesis and an increase in protein or carbohydrate. Merely providing the sequence of the target gene is not a description of the RNAi sequence to be used. In a technical discipline which requires specific sequences for function, the artisan would not be able to envision the specific 20-30 nucleotide RNAi sequence specific for DGAT or CA and, therefore, would not conclude that applicant was in possession of the invention as claimed at the time the specification was filed. Moreover, the presence of more than one isoform of DGAT, the second of which (DGAT2) does not carry out a redundant function, and which is not similar to DGAT1, provies evidence that Applicant has not described the broadly claimed genus of

seed oil suppressing genes that encompass polynucleotides encoding DGAT proteins (Shockley J. *et al.* The Palnt Cell 2006; Vol. 18 pp. 2294-2313; see Abstract; page 2295 col. 1 1st full paragraph; col. 2 Results, second full paragraph; page 2305 col. 2 lines 3-16; and page 2306 col. 2 lines 20-30).

The Federal Circuit has recently clarified the application of the written description requirement. The court stated that a written description of an invention "requires a precise definition, such as by structure, formula, [or] chemical name, of the claimed subject matter sufficient to distinguish it from other materials." *University of California v. Eli Lilly and Co.*, 119 F.3d 1559, 1568; 43 USPQ2d 1398, 1406 (Fed. Cir. 1997). The court also concluded that "naming a type of material generally known to exist, in the absence of knowledge as to what that material consists of, is not a description of that material." Id. Further, the court held that to adequately describe a claimed genus, Patent Owner must describe a representative number of the species of the claimed genus, and that one of skill in the art should be able to "visualize or recognize the identity of the members of the genus." Id.

Finally, the court held:

> A description of a genus of cDNAs may be achieved by means of a recitation of a representative number of cDNAs, defined by nucleotide sequence, falling within the scope of the genus or a recitation of structural features common to members of the genus, which features constitute a substantial portion of the genus. Id.

See also MPEP Section 2163, page 174 of Chapter 2100 of the August 2005 version, column 1, bottom paragraph, where it is taught that

> [T]he claimed invention as a whole may not be adequately described where an invention is described solely in terms of a method of its making coupled with its function and there is no described or art-recognized correlation or relationship between the structure of the invention and its function. A biomolecule sequence described only by a functional characteristic, without any known or disclosed correlation between that function and the structure of the sequence, normally is not a sufficient identifying characteristic for written description purposes, even when accompanied by a method of obtaining the claimed sequence. *See also Amgen Inc. v. Chugai Pharmaceutical* Co. Ltd., 18 USPQ 2d 1016 at

1021, (Fed. Cir. 1991) where it is taught that a gene is not reduced to practice until the inventor can define it by "its physical or chemical properties" (e.g. a DNA sequence).

Given the lack of written description of the sequences, one skilled in the art would not have recognized Applicant to have been in possession of the claimed invention at the time of filing. *See* The Written Description Requirement guidelines published in Federal Register/ Vol. 66, No. 4/ Friday January 5, 2001/ Notices: pp. 1099-1111.

New Matter

14. Claim(s) 2, 5, 11, 17-18, 23, 25 and 88-124 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. This is a NEW MATTER rejection.

Claims 88 and 93 recite "said second seed-oil suppressing gene" and claim 93 recites "a first seed-oil suppressing gene". The recitation of first or second seed-oil

suppressing gene is broader in scope than the early and late seed oil suppressing genes recited in the specification and originally filed claims. Applicant is invited to point out where in the specification support for first and second biosynthetic genes can be found, otherwise, the new matter is required to be cancelled in response to this Office Action.

15. Claims 2 and 89 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. This is a new matter rejection. Applicant's amendment necessitated the new ground(s) of rejection.

Applicant amends "canola" to "*B. napus, B. rapa, and B. juncea.*" No support exists for *B. rapa* or *B. juncea* and Applicant has not cited the page and line number for such support. (*See* Applicant's response, page 25/30, paragraph 3). Applicant's amendment to the specification cannot properly support the amendment to the claims. Reintroducing a capitalized form of the term canola i.e. 'CANOLA' in the claims would obviate this rejection.

Claim Rejections - 35 USC § 112 1st

16. Claims 1-10, 12-14, 16-19, 22-23, 25-37, 39-42, and newly added claims 88-124 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for cotton varieties DP 555 BG/RR and DP 493 does not reasonably provide enablement for reduced oil and increased carbohydrate or protein, or both in

transgenic cells or plants achieved via RNAi or antisense mediated suppression of CA and DGAT. This rejection is maintained for reasons of record set forth in the Official action mailed 8/10/06. Applicants lack of enablement arguments filed 2/12/07 and 2/16/07 have been fully considered but are deemed not persuasive.

Applicant asserts that claims 1-7 and 13-15 were rejected under enablement (response page 17). Applicant is in error: the rejection was over claims 1-44.

Applicant asserts that the invention is directed to plant cells that comprise one or two seed oil suppressing genes (response page 18). See NEW MATTER rejection *supra*. The invention is directed to an early and a late seed oil suppressing gene as stated in the original disclosure.

Nature of the invention *(response page 18)*

Applicant misinterprets *Mycogen* which teaches not that the art at issue therein is unpredictable but instead that the field of biology is unpredictable. The enablement inquiry goes to the teaching of the manner of making and using the claimed invention not to the teaching of the nature and practice of the invention. Moreover, applicant has not taught how to make and use the elected and claimed RNAi molecule or which gene when mutated or targeted by an RNAi transgene will suppress seed oil biosynthesis, or which genes or combinations of genes when targeted by RNAi would retrieve the claimed phenotype. The CAFC, in upholding the lower court, noted that antisense is "a highly unpredictable technology . . . analogizing the predictability of antisense to 'drilling for oil.'" *Enzo Biochem Inc. v. Calgene Inc.*, 52 USPQ2d 1129, 1136 (Fed. Cir. 1999)

and since RNAi shares mechanistic features such as RNA-RNA duplex formation with antisense it too is unpredictable.

Breadth of the Claims *(response page 18)*

The breadth of the claims as stated is indeed accurate. Applicant defines the breadth of the claim language in paragraph 0066 of the specification where they recite a definition of the claimed polynucleotide sequences or mutant alleles that encompasses 'any and all genes directly or indirectly affect[ing] seed oil biosynthesis'.

Further, Applicant provides evidence for the lack of enablement in their submission of the Neogi document in the appendix to the filed amendment. There, Neogi observed that protein levels did not increase concomitantly with the decrease in oil levels. In fact, protein levels decreased; which is contrary to Applicants' assertions. Furthermore, Applicant's statement that "it is clear that these genes do not result in a reduction in seed-oil and a concomitant increase in plant carbohydrate and/or protein" is interpreted as an admission of inoperability of the invention as broadly claimed. (*See* Applicant's Response, page 19, first paragraph). Moreover, Applicant expressly admits that some genes will not work, but fails to teach how to select those and avoid ones which are not operable *a priori*. (*See* Applicant's Response, page 19, first paragraph). Finally, Applicant's admission that the claims encompass any and all seed oil suppressing genes is noted for the record. (*See* Applicant's Response, pages 17-25/30).

Paucity Of Guidance & Working Examples *(response pages 19-20)*

Applicant's argument beginning at the bottom of page 19/30 and extending onto page 20/30 listing discrete claim elements which could be *tried* is not enabling. This list is evidence of the plan or invitation for those of skill in the art to experiment that characterizes the specification's and prior art's lack of enablement for the invention as broadly claimed. Applicant's assertion that because plant transformation was predictable, the claimed invention to CA and DGAT RNAi in plants to lower oil and increase protein/carbohydrate, is predictable is not persuasive because the claimed invention is not a plant transformation method, but is instead directed to RNAi manipulation of oil and protein/carbohydrate yield. The unpredictability comes from not knowing which genes or gene combinations to use to lower oil and increase carbohydrate and/or protein yield; and from how to design an RNAi molecule which will decrease seed oil and increase protein or carbohydrate or both. Further, the question of enablement goes to the claimed invention at the time of filing, not other inventions from a later date.

Applicant's laundry list of genes to *try* is no more than a "plan" or "invitation" for those of skill in the art to experiment.

> In *Enzo Biochem, Inc. v. Calgene, Inc.*, 188 F.3d 1362, 52 USPQ2d 1129 (Fed. Cir. 1999), the court held that claims . . . directed to genetic antisense technology . . . were invalid because the breadth of enablement was not commensurate in scope with the claims . . . Ultimately, the court relied on the fact that (1) the amount of direction presented and the number of working examples provided in the specification were very narrow compared to the wide breadth of the claims at issue, (2) antisense gene technology was highly unpredictable, and (3) the amount of experimentation required to adapt the practice . . . was quite high, especially in light of the record, which included notable examples of the

> inventor's own failures to control the expression of other genes in E. coli and other types of cells. Thus, the teachings set forth in the specification provided *no more than a "plan" or "invitation" for those of skill in the art to experiment* using the technology in other types of cells.

See MPEP 2164.06(b), citing *Enzo*.(emphasis added).

> Tossing out the *mere germ of an idea* does not constitute enabling disclosure. While every aspect of a generic claim certainly need not have been carried out by an inventor, or exemplified in the specification, reasonable detail must be provided in order to enable members of the public to understand and carry out the invention.

See Genentech, 108 F.3d at 1366, 42 USPQ2d at 1005. (emphasis added).

Immature State of the Prior Art *(response page 21-23)*

Applicant's state of the prior art arguments are not persuasive. Applicant appears to be arguing either that the method itself was known and is thus anticipated or that because non-identical methods and or compositions were known, the instant invention is enabled. *None* of the references proffered by applicant teach the claimed RNAi construct in plants which have the claimed phenotype on or before the filing date. *See* the misdirection / false premise argument rebuttal above.

The existence of general methods, such as those presented in Applicant's Response, do not enable the specific method drawn to RNAi. (*See* Applicant's Response, pages 17-25/30). Applicant is directed to the teachings of Rohr (2004) for evidence of lack of predictability and failure of RNAi to manipulate metabolism in transformed plants (see page 612 column 2 1st full paragraph; and results section page 612 to page 615 column 1; especially lines 1-8 in col. 1 on p 615; and col. 2 1 st full paragraph on p. 617). Moreover, Applicant offers no evidence rebutting the teachings

of Rohr. Also, applicant's response is silent with respect to the lack of enablement of "wherein said . . . gene . . . is . . . a transgene."

Lack Of Predictability In The Art *(response page 23-24)*

Applicant's lack of predictability in the art argument is not persuasive. *See* the misdirection / false premise argument rebuttal above. Applicant's argument that individual lines do not need be tested is without merit and fails to rebut the rejection as to lack of enablement of which gene to use, any RNAi molecules, or plants transgenic therewith and with the claimed phenotype. That others have succeeded in expressing some gene in some plant does not prove that all oil pathway manipulation is predictable (*See* the teachings of Voelker et al and Rohr et al, both of record), nor does it prove that Applicants' invention will produce the claimed phenotype in a plant (See Neogi rebuttal). Again, references published after the filing date of an application may not be relied upon for the enablement of the specification.

(*See Enzo*) The CAFC, in upholding the lower court, noted that antisense is "a highly unpredictable technology . . . analogizing the predictability of antisense to 'drilling for oil.'" *Enzo Biochem Inc. v. Calgene Inc.*, 52 USPQ2d 1129, 1136 (Fed. Cir. 1999).

Substantial Amount of Experimentation Necessary *(response pages 24-25)*

Applicant's Neogi argument on the issue of the amount of experimentation is facially without merit. Neogi does not support the claim breadth (see arguments supra) and thus the amount of experimentation is undue. Also, see the teachings of Voelker et

al and Rohr et al, both of record and the reference citations to Rohr *supra*. Applicant's assertion that since FAD2 (not a CA and DGAT RNAi construct) was later shown to work *by another* is irrelevant to the issue of enablement of the claimed invention at the time of filing. References published after the filing date of an application may not be relied upon for the enablement of the specification. Accordingly undue experimentation would be required by one of skill in the art to determine which gene or gene combination of the multitude of the broadly claimed seed oil suppressing genes would result in the claimed phenotype or how to make the RNAi molecule.

Furthermore, the presence of more than one isoform of DGAT, the second of which (DGAT2) does not carry out a redundant function, and which is not similar to DGAT1, complicates the manipulation of seed oil content because the pathway for seed oil biosynthesis is now more complex than previously thought (Shockley J. *et al.* The Plant Cell 2006; Vol. 18 pp. 2294-2313; see Abstract; page 2295 col. 1 1st full paragraph; col. 2 Results, second full paragraph; page 2305 col. 2 lines 3-16; and page 2306 col. 2 lines 20-30).

Claim Rejections - 35 U.S.C. §102/103

17. Claims 1-2, 4, 6, 9-10, 16, 19, 22, 26, 29, 31, 36, and 41-42 remain and claims 119-120 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Lassner et al (issued 9/3/02, 6444876-US-B1, filed June 4, 1999).

Applicants' traversals directed toward the Lassner reference stating that Lassner teaches ACAT-related proteins are misdirected suggesting that Lassner does not

enable DGAT antisense in a plant cell; that Lassner does not teach mutants; and that Lassner et al. does not disclose a plant cell or a plant that comprises a seed-oil suppressing gene in which the expression of the gene results in a reduction of seed-oil with an inherent or concomitant increase in plant carbohydrate and/or protein or stable sucrose pools. (response pages 27-28). Applicants' attention is directed to claims 10-12 of 6,444,876-US-B1 where Lassner teaches in claims 10, 11 and 12 a method of reducing seed oil in a plant by transformation with an antisense diacylglycerol acyltransferase construct (see claim 11) and reduced triacylglycerol (see claim 12) that reads upon the broadly and instantly claimed 'plants comprising a seed oil suppressing gene' and 'reduced seed oil content plants'. Further, the traversal that Lassner allegedly does not disclose an inherent property of plants or plant cells expressing a DGAT (antisense) seed oil suppressing gene is a misplaced criticism of the anticipation analysis because the prior art reference teaches a plant that is transformed with the DGAT seed oil suppressing gene i.e. the antisense DAGAT in Lassner which is equivalent to the instantly claimed composition because the only component of the instantly claimed composition that requires the hand of man is the transgene or mutant allele that suppresses seed oil biosynthesis; and thus the reference does meet the limitations of the concomitant increases in either protein or carbohydrate; and the stable sucrose pools of claims 42 and 119-120.

18. Claims 1-2, 4, 6, 9-10, 16, 22, 26, 29, 31, 36, 41-42 and 119-120 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Jako C. *et al.* Plant Physiology 2001 Jun; 126(2): 861-74.

Applicant broadly claims a reduced seed oil plant or plant cell comprising a gene of unspecified source, identity, length, or design that suppresses seed oil biosynthesis in a plant that is either a transgene or a mutant allele.

Jako teaches a DGAT mutant plant– the same mutant plant later claimed by Applicant – with decreased seed oil content as compared to wild type. (*See* specification paragraph [0044]; Jako in figure 1 on page 862 teaches that the DGAT mutant comprises the same mutant DGAT gene as claimed by Applicant, and thus inherently possess all of the instantly claimed features of either the transformed or mutant plants. Thus the reference teaches all the limitations of claims 1-2, 4, 6, 9-10, 16, 22, 26, 29, 31, 36, 41-42 and 119-120.

Claim Rejections - 35 U.S.C. §103

19. Claims 1-10, 12-14, 16-19, 22-23, 25-37, 39-42 remain and newly added claims 88-124 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lassner et al (9/02, 6444876-US-B1) in view of Dudley et al (1992) Maydica 37:81-87) and in further view of May, O.L. (14th EFS System Conference, 11-13 June 2001, Greenville, SC (Made of record by Applicant) and in further view of Applicant's specification. This rejection is maintained for reasons of record set forth in the Official action mailed 8/10/06. Applicants arguments filed 2/12/07, 2/16/07 have been fully considered but are not deemed persuasive.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention

where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Applicant traverses primarily that the combination of Auld et al. and Dudley et al. does not render the claimed invention obvious because the combination does not suggest produc[ing] plants having a seed-oil suppressing gene; or plants having a first seed-oil suppressing gene and a second seed-oil suppressing gene in which the plant has a reduction in seed-oil and an increase in plant carbohydrate and/or protein.

The rejection has been modified to include the teachings of May.

Applicant broadly claims a reduced seed oil plant or plant cell comprising either one or two genes of unspecified source, identity, length, or design that suppresses seed oil biosynthesis in a plant that are either transgenes or mutant alleles.

Lassner teaches or suggests a reduced seed-oil content plant cell (claims 8, 13, 1-32) comprising a seed-oil suppressing gene under control of a plant-active promoter (column 9, lines 7-30), wherein a plant comprising said plant cells and expressing said seed-oil suppressing gene exhibits a reduction in seed-oil and a concomitant increase in plant carbohydrate, protein or both and wherein said seed-oil suppressing gene is a mutant allele of a gene naturally occurring in said plant or a transgene (column 27, line 29), wherein said plant cell is from cotton, corn, or soybean (claim 15; column 10, line 45), including. (Claims 1-32, particularly claims 10-12, column 10, line 45; column 2, line 29; column 9, lines 7-30).

Lassner also teaches or suggests a reduced seed-oil content plant (Example 7 and 8, claims 8, 15) which comprises cells that comprise and express a seed-oil suppressing gene (column 2, line 29; column 26, line 48; Example 6; sequence listing) under control of a plant-active promoter (column 9, lines 7-30), wherein said plant exhibits a reduction in seed-oil and a concomitant increase in plant carbohydrate, protein or both, wherein said seed-oil suppressing gene is a transgene (column 2, line 29; column 26, line 48; claims 10-12; sequence listing), wherein said seed-oil suppressing gene is introduced into the germplasm of said plant (Example 7), wherein said seed-oil suppressing gene controls seed-oil content by suppressing seed-oil biosynthesis (claims 10-12), wherein expression of said seed-oil suppressing gene (claims 10-12 column 2, line 29; column 26, line 48; front page of spec, right column, 11th paragraph) suppresses CA or DGAT, wherein said cotton plant has enhanced fiber yield, wherein expression of said transgene suppresses CA or DGAT, wherein said seed-oil suppressing gene is a nucleic acid that encodes an RNAi sequence (claims 10-12, more particularly claim 11; column 2, line 29; column 26, line 48; front page of patent, right column, 11th paragraph) wherein said transgene is operatively linked to a constitutive 35S promoter from cauliflower mosaic virus (column 9, lines 7-30), wherein said transgene is operatively linked to a seed-specific napin gene promoter (column 9, lines 7-30) or the soybean alpha-conglycinin gene promoter (column 9, lines 7-30).

Lassner also teaches that an important step in the formation of TAG is the acylation of the sn-3 position of sn-1,2-diacylglycerol by diacylglycerol acyltransferase (DAGAT, EC 2.3.1.20) ultimately forming triacylglycerol (TAG). (column 2, lines 21-37).

Lassner does not teach wherein said plant cell further comprises a second seed-oil suppressing gene under control of a plant-active promoter, wherein said second seed-oil suppressing gene is a mutant allele of a gene naturally occurring in said plant or a transgene, or wherein said plant comprises cells that comprise and express a first and a second seed-oil suppressing gene each under the control of a plant-active promoter.

Dudley teaches untransformed plant breeding and that decreasing TAG and oil content would increase flow away from lipids and towards carbohydrate in plant seeds.

> "Selection for either protein or oil has resulted in changes in percent starch as would be expected given that starch is the largest component of the kernel and thus is the component most likely to be affected by a change in either protein or oil.
>
> In general, changes in % starch per percentage point change in oil were higher than changes per percentage point protein. Given that oil is higher in caloric value than protein, this difference might be expected."

(Dudley, (1992) *See* p. 87, left Col. 1st and 2nd para.).

May teaches "a possible avenue to further increase cotton yield is to partition more photosynthate into lint and less into seed oil. . . [, that] seed oil concentration . . . and . . . content . . . are heritable characteristics . . . [which can] be manipulated through selection." (page, 138-139, beginning bottom of page 138).

Applicant's specification admits that many claim elements are known in the art:

The following list shows where in the specification the admitted prior art meets specific claim limitations;

ethyl methanesulfonate (EMS)-derived DGAT mutants had reduced activity and seed-oil content (Specification paragraph [0046]; instant claims 12-14);

CA is known in the art as a potential target for lipid biosynthesis suppression in the cotton (Specification paragraph [0043]; instant claims 16, 18, 22, 25, 100, and 102);

DGAT (Specification paragraph [0046]; instant claims 16, 18, 22, 25, 100, and 102);

"Cosuppression (or gene silencing), antisense, immunomodulation, ribozyme, transcription factor suppression or RNAi strategies are all known per se to those skilled in the art" (Specification paragraph [0049]; instant claims 26 and 103);

"alpha-globulin promoter (AGP) from cotton recently has been identified and shown to have a high level of seed-specific activity in cotton" (Specification paragraph [0049]; instant claims 39, 108); "regulat[ing]

gene expression using an excisable block. . .". (Specification paragraph [0053]); constitutive promoters (Specification paragraph [0019]; instant claims 27-39, 104-116);

seed-specific promoters (Specification paragraph [0019]; instant claims 27-39, 104-116); synthetic seed-specific "core" promoters (Specification paragraph [0083]; instant claims instant claims 31 and 109);

In paragraph [0044] **Hobbs** (1999) FEBS Letters, 452:145-149) teaches *Arabidopsis* DGAT cDNA and suggests that DGAT has a role in controlling seed storage oil yield. (*See* abstract at least; page 148, right column, last paragraph).

In paragraph [0081] **Auld** (1998) Proceedings of the Belt wide Cotton Conf, 1 :550-552) teaches untransformed plant mutagenesis and that methods (p. 550, right Col., 3rd full para.) of elite cultivars (p. 550-552) cotton native-gene mutagenesis (p. 550, left Col.), including ems and random mutagenesis (p. 550-552), ". . . can have . . . [a tremendous] . . . impact on developing new genes that enhance the fiber and other

economically important traits of cotton (*Gossypium hirsutum* L.) . . ." (See Abstract, p. 550, left Col. 1st para.).

The limitations of claims 27-39 and 104-115 regarding choice of promoters and/or their cognate inducer would have been the optimization of construct design and/or optimization of promoter choice well within the ken of the ordinarily skilled artisan. The making of synthetic promoters by attaching seed-specific promoter elements to the 35S core promoter is well known to the skilled artisan. Moreover, promoters may be optimized to maximize expression levels without any unexpected results. The advantage of genetic element optimization in gene constructs is a well known phenomenon in the art of genetic engineering of plants.

The limitations of claims 40 and 116 regarding the use of excisable blocking sequences would have been the optimization of construct design well within the ken of the ordinarily skilled artisan. One of ordinary skill in the art would have appreciated the advantages of using well known so-called "terminator" technology and similar technologies to achieve male sterility and/or to prevent farmers from saving seed.

The limitations of claims 42, and 117-124 regarding properties of the instantly claimed compositions would be inherently met by the compositions of Lassner in view of Auld and further in view of Dudley and further in view of May and further in view of Applicant's specification. Because the structure is the same, the properties must necessarily and inherently be the same.

The use of elite or primitive cultivars (instant claims 7-8, 97-98) would have been the obvious optimization of germplasm choice. One of ordinary skill in the art would have

appreciated the advantage of selecting or optimizing germplasm or cultivars to for example match the maturity zone or harvest date.

One of ordinary skill in the art would have appreciated the advantages of using various methods of mutagenesis methods well known to the skilled artisan (instant claims 12-13) to make mutant stocks (instant claim 14).

One of ordinary skill in the art would have appreciated the advantages of suppression of oil pathway gene expression (instant claims 16, 18, 22, 25, 100, and 102) to increase lint and fiber yield in cotton by reducing seed TAG.

One of ordinary skill in the art would have appreciated the advantages of introducing the gene into the germplasm, e.g., heritability (instant claims 9 and 12).

It would have been *prima facie* obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Lassner to substitute a transformed or mutagenised cotton plant for the transformed *Brassica* plant of Lassner with an RNAi and/or mutagenesis method to retrieve a suppressed seed oil phenotype; and to also combine the admitted prior art teaching of the CA gene as a target for seed oil suppression from the specification with the antisense DGAT of Lassner, to make a double RNAi construct of both CA and DGAT or alternatively to make a plant having an RNAi CA seed suppressing gene to be bred to the DGAT mutant of Jako (DGAT mutants have decreased seed oil) using methods known in the art and similar to those techniques taught by Lassner (DGAT antisense in plants) and Auld (cotton mutagenesis) for the purposes of oil suppression in cotton as taught by May (photosynythate partitioning from oil to fiber will increase fiber yield), and to do so with

any of the transgenic and/or breeding methods admitted as prior art in Applicant's specification as set forth hereinabove, including RNAi or mutagenesis. One skilled in the art would have been motivated to generate the claimed invention because one of ordinary skill in the art would have appreciated that decreasing TAG and oil content would increase flow away from lipids and towards carbohydrate in plant seeds as taught by Dudley and May because "the oil in cottonseed requires much more of the plant's energy to create compared with the energy to produce cellulose (lint)" as taught by May and that "a possible avenue to further increase cotton yield is to partition more photosynythate into lint and less into seed oil" as taught by May. One of ordinary skill in the art would have a reasonable expectation of success because DGAT controls oil flux into seeds as taught by Jako and Lassner and that modifying cotton seed for lower oil is a reasonable strategy for increasing fiber or carbohydrate as taught by May and because a plurality of methods of plant transformation using antisense or RNAi are known in the art according to applicant's specification. Accordingly, one of ordinary skill in the art would have generated the claimed invention; wherein the choice of a constitutive, seed specific, chimeric, inducible/repressible (i.e. activated by an external stimulus with or without an excisable blocking sequence), or the cotton AGP promoter in the transformed or mutagenized plant or plant seed is an obvious experimental design choice absent any evidence of criticality.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brendan O. Baggot whose telephone number is 571/272-5265. The examiner can normally be reached on Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anne Marie Grunberg can be reached on 571/272-0975. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Brendan O. Baggot
Patent Examiner
Art Unit 1638

RUSSELL P. KALLIS, PH.D.
PRIMARY EXAMINER

bob